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Educational Product	
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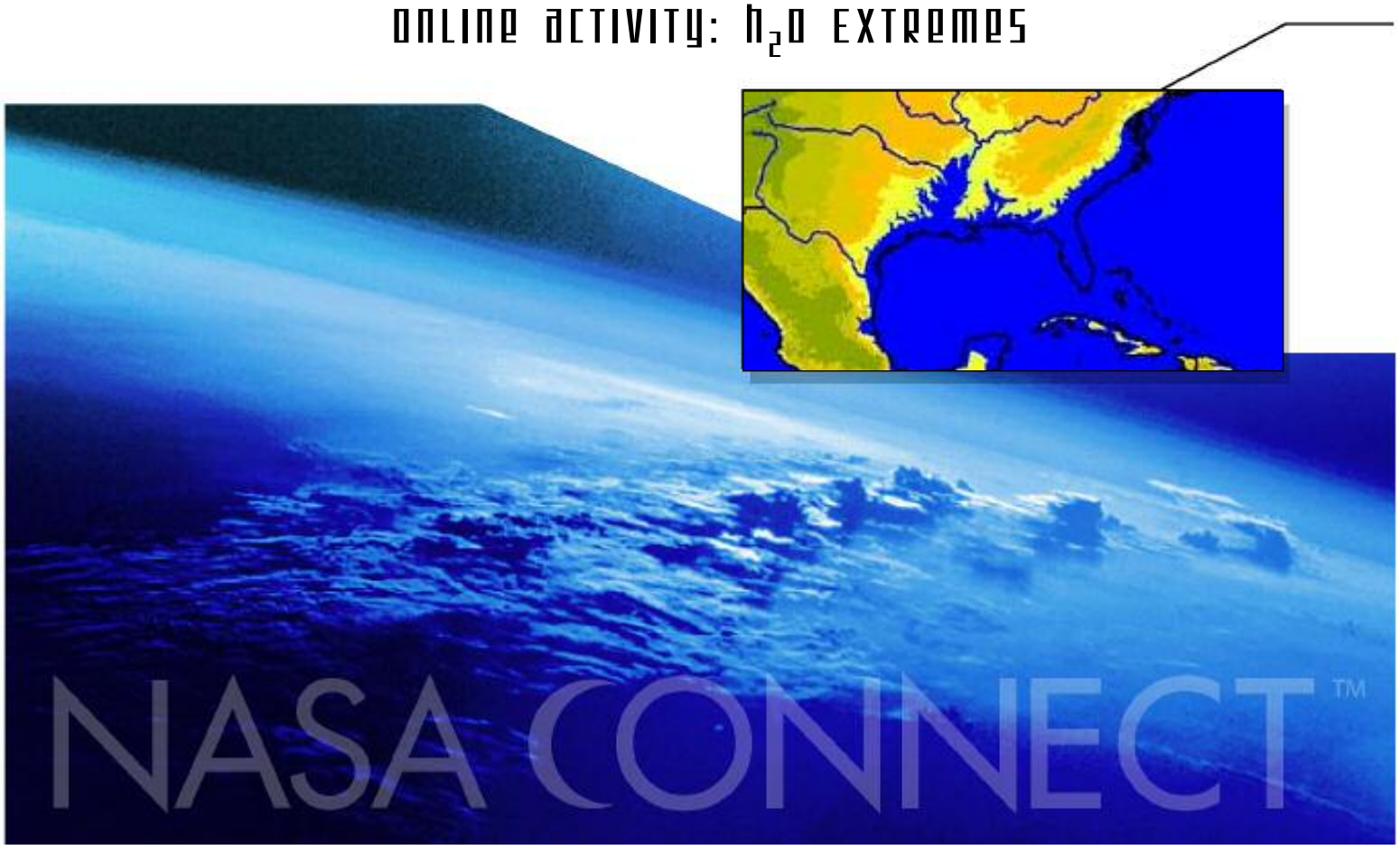
NASA CONNECT™

VIRTUAL EARTH

An Educator Guide with Activities in Mathematics, Science, and Technology

ONLINE ACTIVITY: H_2O EXTREMES



NASA CONNECT™: *Virtual Earth* is available in electronic format through NASA Spacelink - one of NASA's electronic resources specifically developed for the educational community. This publication and other educational products may be accessed at the following address:
http://spacelink.nasa.gov/products

A PDF version of the educator guide for NASA CONNECT™ can be found at the NASA CONNECT™ web site: **http://connect.larc.nasa.gov**

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www.aiaa.org

www.cnu.edu

www.nctm.org

www.cgcs.org


www.getmagic.net

www.iteawww.org

www.nsta.org

www.nec.com

www.nasa.gov

http://knowitall.org

http://digitalquest.com/spacestars

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AIAA FOUNDATION Registered users of NASA CONNECT™ may request an American Institute of Aeronautics and Astronautics (AIAA) classroom mentor. For more information or to request a mentor, e-mail **nasaconnect@aiaa.org**.

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PROGRAM OVERVIEW

LESSON OVERVIEW

NASA and its partners, DOE, EPA, FEMA, NOAA, USDA, and USGS, band together to study Antarctic ice sheet melting and the carbon cycle. Data from the NASA satellite missions are used to create geospatial models that help their partners build decision and support tools to monitor ice sheets and the carbon cycle.

This web activity will help you and your students learn more about Earth system science. *H_2O Extremes* contains images created by using geographic information systems (GIS) that would allow you to view changes in Earth systems if the ice sheets of Antarctica melted. Students will first make observations on a global level and then on a city level by investigating Washington, D.C. and Seattle, Washington. As students explore these images, they will learn about the NASA technologies and agencies that collect and analyze all this information.

Note: *H_2O Extremes* is an Internet extension activity based on a lesson, *Water World*, from the GIS workbook and software package from ESRI Press, Mapping Our World: GIS Lessons for Educators. If you are interested in finding out more, go to *www.gisetc.com/nasa*.

NATIONAL STANDARDS

National Science Standards

Unifying concepts and processes in science

- Change, constancy, and measurement

Earth and space science

- Structure of the Earth system

Science and technology

- Understanding science and technology

National Geography Standards

- The student understands the relative advantages and disadvantages of using maps, globes, aerial and other photographs, satellite-produced images, and models to solve geographic problems.
- The student understands how different physical processes shape places.
- The student understands how the interaction of physical and human systems may shape present and future conditions on Earth.

ONLINE ACTIVITY

PREPARING FOR THE ACTIVITY

Student Materials

- computers with Internet access
- Student Handout - H_2O Extremes Worksheet

Time for Activity

- 1 to 2 45-minute class periods

Teacher Materials

- H_2O Extremes Answer Key

LESSON INTRODUCTION

Watch the NASA CONNECT™: *Virtual Earth* program. Remind the students about the various Earth systems they heard about and the interactions of those systems. Explain to them that they are going to investigate a "virtual Earth" model on the Internet by using geographic information systems, or GIS. If you would like additional resources on what GIS is, go to *http://www.gis.com/whatisgis/index.html* .

THE ACTIVITY

Have the students work in teams of 2–3 to complete the web activity. You may find it helpful to define roles such as recorder, mouse driver, and so on, when you have more than one student on a machine. Pass out the student handout to each student.

Students should access the web activity at the following web site:
http://digitalquest.com/spacestars/waterworld

Part 1: Antarctica

This part of the activity allows the students to explore Antarctica, and in particular the amounts of snow and ice found there. Make sure that the students pay special attention to the various satellites and NASA instruments (located on the bottom right-hand corner) that collect the various data sets and images they see on the page. When the students are ready, they can click on part of the Antarctica map to view the global impact of the melting of that part of the Antarctic ice sheet.

Part 2: Global Views

This part of the activity has the students analyzing the changes to sea level at a global level. As the students investigate each level, they must answer a question located at the bottom of the text box underneath the picture. Be sure that the students realize they can click on a region of the world to get a zoomed-in image.

Part 3: City Views

After completing the global investigation, they can then go to the City Views section of the web activity. Here they will answer a series of questions about their observations of each city. This part of the activity allows them to take a microscopic view of the phenomenon.

Conclusion

To wrap up the activity, have each small group partner with another group to share observations. After 2–3 minutes, have each larger group report its findings to the whole class. If you are short on time, you may want to focus your discussion on the final question from the City Views section: "Both of these locations have historic and cultural landmarks that you can identify by moving your cursor over the image. What could be done to help protect these important landmarks?"

H_2O EXTREMES

STUDENT HANDOUT: H_2O EXTREMES WORKSHEET

Part 1: Antarctica

1. Match the NASA satellite or instrument to its description.

___**Sea Winds on QuickSCAT**	A. An instrument that is used to study ocean surface features, including the movement of icebergs. It also gathers data and images of natural phenomena such as phytoplankton blooms.
___**MODIS**	B. A specialized radar that can measure wind speed and direction near the surface of the Earth over the oceans. The data are used by scientists to study sea ice movements at the poles.
___**SeaWiFS**	C. The flagship of the Earth Observation System (EOS). It contains 5 different instruments for studying global climate and environmental change.
___**Terra**	D. This instrument measures ocean color, sea surface temperature, and ocean primary production (plankton).

2. The South Pole moves an average of how many feet per year?

   A. 3 ft.
   B. 30 ft.
   C. 300 ft.
   D. It does not move

3. On which part of Antarctica is ice melting the fastest?
   A. Western
   B. Eastern
   C. South Pole
   D. Northern

4. Vostok is the largest of this unusual phenomenon on Earth.
   A. glacier
   B. ice flow
   C. mountain peak
   D. subglacial lake

H_2O EXTREMES

STUDENT HANDOUT: H_2O EXTREMES WORKSHEET [CONTINUED]

Part 2: Global Views
World at Sea Level

5. Where do you think the worst flooding will occur?

5-Meter Change

6. What area of the world is most affected by the 5-meter change?

7. Is this area the one you expected? Explain your answer.

50-Meter Change

8. What area of the world is most affected by the 50-meter change?

9. What is the biggest difference between the 5-meter rise and the 50-meter rise in sea level?

Total Thaw

10. What is the most affected part of the Earth?

11. Besides massive flooding, what other changes do you think would occur?

12. How does the dramatic change in one Earth system affect all the others?

H_2O EXTREMES

STUDENT HANDOUT: H_2O EXTREMES WORKSHEET [CONCLUDED]

Part 3: City Views

Fill in the table with your observations of each city.

	WASHINGTON D.C.	SEATTLE, WA
Do the cities flood at the same rate and why?		
If you were a city planner or official, how would you propose to prepare for the flooding?		
Both of these locations have historic and cultural landmarks that you can identify by moving your cursor over the image. What could be done to help protect these important landmarks?		

H_2O EXTREMES

Teacher Handout: Answer Key

Part 1: Antarctica

1. Match the NASA satellite or instrument to its description.

B Sea Winds on QuickSCAT	A. An instrument that is used to study ocean surface features including the movement of icebergs. It also gathers data and images on natural phenomena such as phytoplankton blooms.
D MODIS	B. A specialized radar that can measure wind speed and direction near the surface of the Earth over the oceans. The data are used by scientists to study sea ice movements at the poles.
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4. Vostok is the largest of this unusual phenomenon on Earth.

A. glacier
B. ice flow
C. mountain peak
D. subglacial lake

H_2O EXTREMES

Teacher Handout: Answer Key [continued]

For the remaining questions, student answers will vary. Please refer to the web activity Global View and City View maps to check student observations.

Part 2: Global Views

World at Sea Level

5. Where do you think the worst flooding will occur?

5-Meter Change

6. What area of the world is most affected by the 5-meter change?

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Total Thaw

10. What is the most affected part of the Earth?

11. Besides massive flooding, what other changes do you think would occur?

H_2O EXTREMES

TEACHER HANDOUT: ANSWER KEY [CONCLUDED]

12. How does the dramatic change in one Earth system affect all the others?

Part 3: City Views

Fill in the table with your observations of each city.

	WASHINGTON D.C.	SEATTLE, WA
Do the cities flood at the same rate and why?		
If you were a city planner or official, how would you propose to prepare for the flooding?		
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